WHAT IS CLAIMED IS:

1. A regulated laser welding apparatus for laser welding a first workpiece and a second workpiece to join the workpieces along a joint, said apparatus comprising:

a laser welding device including a laser beam source arranged to be movable in a welding direction along said joint of said workpieces, wherein said laser beam source is further movable with respect to at least one of a location and an orientation thereof relative to said joint of said workpieces, and wherein said laser beam source is adapted to emit a laser bema directed at a weld point on said joint of said workpieces so as to form a weld seam therealong to join said workpieces;

a sensor arrangement including a sensor arranged on or near said laser welding device and coupled to said laser welding device so as to move together with or following said laser beam source in said welding direction along said joint of said workpieces, wherein said sensor is directed at said weld seam formed by said laser beam along said weld joint so as to detect actual seam information characterizing at least one of an actual seam position and an actual seam flank angle of said weld seam that is actually formed by said laser beam;

a weld seam position regulating arrangement that is connected to said sensor arrangement so as to receive said actual seam information, and that includes a regulating circuit adapted to carry out a comparison of said actual

seam information with nominal desired seam information characterizing at least one of a desired seam position and a desired seam flank angle of said weld seam that is to be produced, and to generate a regulating value based on a result of said comparison; and

an adjusting device that is connected to said weld seam position regulating arrangement so as to receive said regulating value, and that includes an actuator arrangement coupled to said laser welding device and adapted to adjust at least one of said location and said orientation of said laser beam source relative to said joint of said workpieces in response to and dependent on said regulating value.

2. The apparatus according to claim 1, wherein said actual seam information characterizes said actual seam flank angle, and said nominal desired seam information characterizes said desired seam flank angle.

3. The apparatus according to claim 1, wherein said actual seam information characterizes said actual seam position, and said nominal desired seam information characterizes said desired seam position.

4. The apparatus according to claim 1, wherein said weld seam position regulating arrangement includes an external input connected to said regulating circuit and adapted to receive an externally supplied seam information as said nominal desired seam information.

5. The apparatus according to claim 4, wherein said regulating circuit further comprises a memory storing an internal stored seam information as said nominal desired seam information.

6. The apparatus according to claim 5, wherein said regulating circuit further comprises a threshold evaluating component that is connected to said external input so as to receive said externally supplied seam information and to said memory so as to receive said internal stored seam information, and that is adapted to carry out an evaluation of said externally supplied seam information relative to a threshold value, and to selectively provide either said externally supplied seam information or said internal stored seam information as said nominal desired seam information in response to and dependent on a result of said evaluation.

7. The apparatus according to claim 1, wherein said regulating circuit further comprises a memory storing an internal stored seam information as said nominal desired seam information.

8. The apparatus according to claim 1, wherein said regulating circuit comprises a comparator that receives said actual seam information and said nominal desired seam information and carries out said comparison thereof.

9. The apparatus according to claim 8, wherein said regulating circuit further comprises a converter component that receives said result of said comparison from said comparator and generates therefrom said regulating value.

10. The apparatus according to claim 1, wherein said sensor comprises a sensor head positioned proximate to said weld seam and oriented with a sensing axis thereof directed at said joint.

11. The apparatus according to claim 1, wherein said laser beam source is a first laser beam source forming said weld seam as a first weld seam, said laser welding device further comprises a second laser beam source, said first and second laser beam sources are arranged respectively on opposite sides of said first workpiece, said second laser beam source is adapted to emit a second laser beam directed at said weld point on said joint so as to form a second weld seam therealong on an opposite side of said first workpiece relative to said weld seam formed by said laser beam emitted by said first laser beam source, said sensor is a first sensor, said sensor arrangement further comprises a second sensor, said first and second sensors are arranged respectively on said opposite sides of said first workpiece, said second sensor is arranged on or near said laser welding device and coupled thereto so as to move together with or following said second laser beam source in

said welding direction along said joint of said workpieces, and said second sensor is directed at said second weld seam.

12. The apparatus according to claim 11, further comprising a common data line connected to both of said sensors and to said weld seam position regulating arrangement.

13. The apparatus according to claim 1, wherein said sensor is an optical sensor.

14. The apparatus according to claim 1, wherein said sensor is a light section sensor that optically detects a geometry of said weld seam to provide said actual seam information.

15. The apparatus according to claim 1, wherein said weld seam position regulating arrangement comprises a proportional or differential one-way regulator.

16. A method of laser welding a first workpiece and a second workpiece to join the workpieces along a joint, comprising the steps:

a) arranging said first workpiece and said second workpiece to be joined along said joint therebetween;

b) emitting a laser beam from a laser beam source and directing said laser beam at a weld point on said joint;

c) moving said laser beam source in a welding direction along said joint to thereby move said weld point along said joint so as to form a weld seam therealong to join said workpieces;

d) during said step c), using an optical sensor, optically sensing actual seam information characterizing at least one actual value of at least one physical geometric parameter of said weld seam;

e) comparing said actual seam information with nominal desired seam information characterizing at least one nominal desired value of said at least one physical geometric parameter of said weld seam, to produce a comparison result;

f) when said comparison result indicates an unacceptable deviation of said actual seam information from said nominal desired seam information, then adjusting at least one of a location and an orientation of said laser beam source to a new adjustment relative to said joint, dependent on and responsive to said comparison result, and continuing or repeating said steps c), d) and e) with said new adjustment of said laser beam source.

17. The method according to claim 16, wherein said at least one physical geometric parameter of said weld seam comprises a weld seam flank angle of said weld seam.

18. The method according to claim 17, wherein said nominal desired value of said weld seam flank angle is in a range from 40° to 50°, and wherein said steps c), d), e) and f) are carried out so that said actual value of said weld seam flank angle is maintained in or brought into a range from 40° to 50°.

19. The method according to claim 17, wherein said step d) comprises optically detecting a surface tangent plane of a surface of said second workpiece and a weld seam tangent that passes through a first intersection of a surface of said weld seam with a surface of said first workpiece and a second intersection of said surface of said weld seam with said surface of said second workpiece, and said step c) further comprises determining said actual value of said weld seam flank angle as an angle enclosed between said surface tangent plane and said weld seam tangent.

20. The method according to claim 16, wherein said at least one physical geometric parameter of said weld seam comprises a seam position of said weld seam.

21. The method according to claim 20, wherein said nominal desired value of said seam position is in a range from + 0.3 mm to + 0.5 mm, and said steps c), d), e) and f) are carried out so that said actual value of said seam position is maintained in or brought into a range from + 0.3 mm to + 0.5 mm.

22. The method according to claim 20, wherein said step d) comprises optically detecting a laser beam entry point at which said laser beam penetrates into said first workpiece on a surface of said first workpiece during said steps b) and c), and optically detecting a surface tangent plane of a surface of said second workpiece, and then determining said actual value of said seam position as a spacing distance between said laser beam entry point and said surface tangent plane.

23. The method according to claim 16, wherein said adjusting in said step f) is carried out so as to change a beam incidence angle of a beam axis of said laser beam relative to a plane of a surface of said second workpiece.

24. The method according to claim 23, further comprising optically detecting said beam axis of said laser beam and said plane of said surface of said second workpiece, and then determining said beam incidence angle.

25. The method according to claim 16, further comprising providing an externally generated or input value as said nominal desired seam information for use in said step e).

26. The method according to claim 16, further comprising calling up a stored value from a memory as said nominal desired seam information for use in said step e).

27. The method according to claim 16, further comprising, before said step b), a preliminary step of adjusting at least one of said location and said orientation of said laser beam source to an initial adjustment based on and dependent on said nominal desired seam information.

28. The method according to claim 16, further comprising, after said step a) and before said step b), an additional step of optically sensing an area of said joint of said first and second workpieces, and determining therefrom said nominal desired value of said physical geometric parameter that is to be provided for said weld seam to be formed.

29. The method according to claim 16, further comprising obtaining interference value information characterizing an interference that interferes with at least one of said steps b), c) and d), and if said actual seam information is missing or faulty, then substituting said interference value information for said actual seam information in carrying out said comparing in said step e).

30. The method according to claim 16, wherein said first workpiece is a stiffening stringer and said second workpiece is a flat sheetmetal shell component for fabricating an aircraft fuselage shell.